

Research Summary

AMR Leader-Follower System TMA Evaluation

Although workers are protected by a truck mounted attenuator (TMA) during mobile operations, vehicle crashes with TMAs and worker injuries still occur. To reduce worker injuries in TMA crashes, the Missouri Department of Transportation (MoDOT) is piloting a Leader-Follower TMA system in two districts. With this system, the worker can be removed from the follower vehicle, and connected vehicle technology is used to guide the follower vehicle to follow the path of the leader vehicle. The objectives of this research study are to evaluate MoDOT's pilot program for Leader-Follower TMAs, to synthesize practices of other state DOTs regarding Leader-Follower TMAs, and to identify obstacles to implementation faced by other state DOTs.

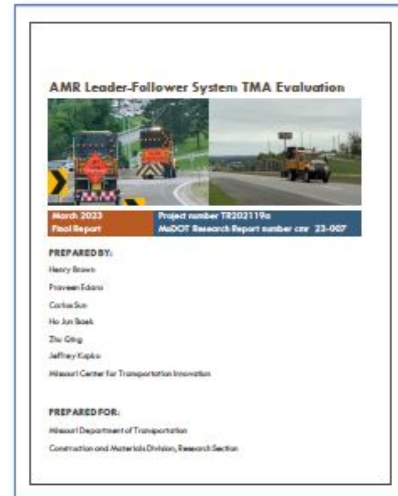
During operations, the leader-follower TMA system uses electronic breadcrumbs (E-Crumbs) to guide the follower TMA to follow the path of the leader vehicle while maintaining a user-defined, safe distance. If Global Positioning System (GPS) satellite signal is lost, the system will switch into dead reckoning (DR) mode. The leader-follower TMA system will initialize an Automatic Stop (A-Stop) if there is an obstacle in the path of the follower TMA or if GPS signals are not re-established in less than 45 seconds after entering DR mode.

Results of prior evaluation or feasibility studies for Leader-Follower TMA systems generally

show that the system performed as expected, with some challenges related to GPS-denied environment, tight turns, and path deviations.

"Overall, findings indicate the Leader-Follower TMA has the potential to be an effective tool in improving safety for workers in mobile work zones."

Among the 43 agencies that completed the survey, four agencies have implemented Leader-Follower TMA systems, while 19 agencies are exploring or have previously explored them, and 20 agencies are not exploring their potential use. Most agencies that have implemented the system are generally satisfied with the system. There are some concerns regarding reliability of the system, especially with regard to losing GPS signal. Among implementing agencies, the highest ranked challenges to implementation include lack of agency buy-in, maintenance cost, and technology cost. Other non-technical challenges, such as procurement, operations, and legislation, were also noted. Agencies that have not implemented Leader-Follower systems ranked an inability to obtain the desired performance, funding constraints, the need for data on performance, and other initiatives being a higher priority as implementation challenges.



Field study results indicated the system seemed effective at maintaining gap distance and speed, while there were some A-stops and DRs, typically at bridges and sign trusses.

MoDOT employees generally conveyed a positive perception of the system and believed that it could potentially help to improve work zone safety. The primary areas of concern regarding the system were loss of GPS signal and logistical considerations for the follower vehicle. Solutions suggested by MoDOT employees to address these concerns include a supplementary lane assist system, additional cameras on the follower vehicle, and a remote alarm for alerting traffic.

Results of an economic analysis indicated a benefit-cost-ratio (BCR) of 0.83. There is potential for the BCR to increase in the future as costs will likely decrease due to economies of scale. A user-friendly spreadsheet developed in this project can be used to adjust the input values to calculate BCRs for different situations.

Overall, findings indicate the Leader-Follower TMA has the potential to be an effective tool in improving safety for workers in mobile work zones. With the system, the driver can be removed from the follower vehicle, thus reducing exposure to risk; drivers still in the follower vehicle are able to focus more on traffic.



Figure 1: User interface for Leader-Follower TMA system.

Project Information

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